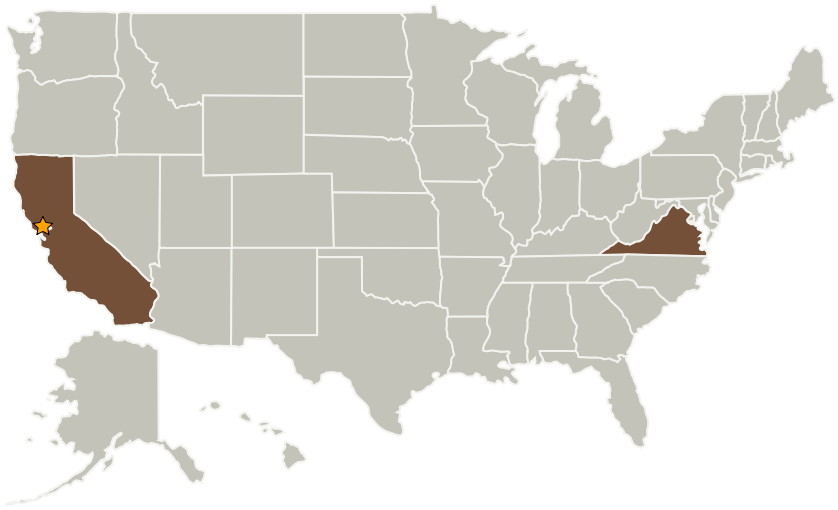
MILP-Based 4D Trajectory Planning for Tactical Trajectory Management, Phase I

Completed Technology Project (2007 - 2007)

Project Introduction

Aurora Flight Sciences proposes to develop specialized algorithms and software decision-aiding tools for four-dimensional (4D) vehicle-centric, tactical trajectory management (TTM), derived from algorithms developed at the Massachusetts Institute of Technology (MIT) to perform similar functions in military scenarios. These algorithms, based on the concept of receding horizon mixed-integer linear programming (RH-MILP), will be specifically tailored to the problem of optimizing the trades between multiple 4D trajectories (4DTs) in the dynamic airspace environment. In particular, the innovation that Aurora proposes is to model and address the stochastic nature of weather and associated airspace and resource restrictions in the flight path, respecting the fact that the time horizon over which sufficiently accurate weather estimates are available may be short compared to the overall TTM request-assign-update cycle (as envisioned by planners of the Next Generation Air Transportation System). The general problem of increasing uncertainty as planning horizons increase will be a central focus of algorithm development. This innovation addresses the needs for rapidly accommodating dynamic changes in aircraft tactical situations and responding to detected external hazards, for introducing any-time planning algorithms, and for generation and specification of 4D trajectories. Currently algorithms that directly address these needs in the context of the NGATS concept of operations (CONOPS) are in the early development stages; technology transition from related military approaches as described herein will therefore greatly benefit the state of the art in national airspace system (NA) operational tools.

Primary U.S. Work Locations and Key Partners



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Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Center / Facility:

Ames Research Center (ARC)

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

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Organizations Performing Work	Role	Type	Location
★Ames Research Center(ARC)	Lead Organization	NASA Center	Moffett Field, California
Aurora Flight Sciences Corporation	Supporting Organization	Industry	Cambridge, Massachusetts

Primary U.S. Work Locations	
California	Virginia

Project Management

Program Director:

Jason L Kessler

Program Manager:

Carlos Torrez

Technology Areas

Primary:

- TX15 Flight Vehicle Systems
  - TX15.2 Flight Mechanics
    - TX15.2.1 Trajectory Design and Analysis